Figure 3.19-7: CO Second-Highest 8-Hour Concentration

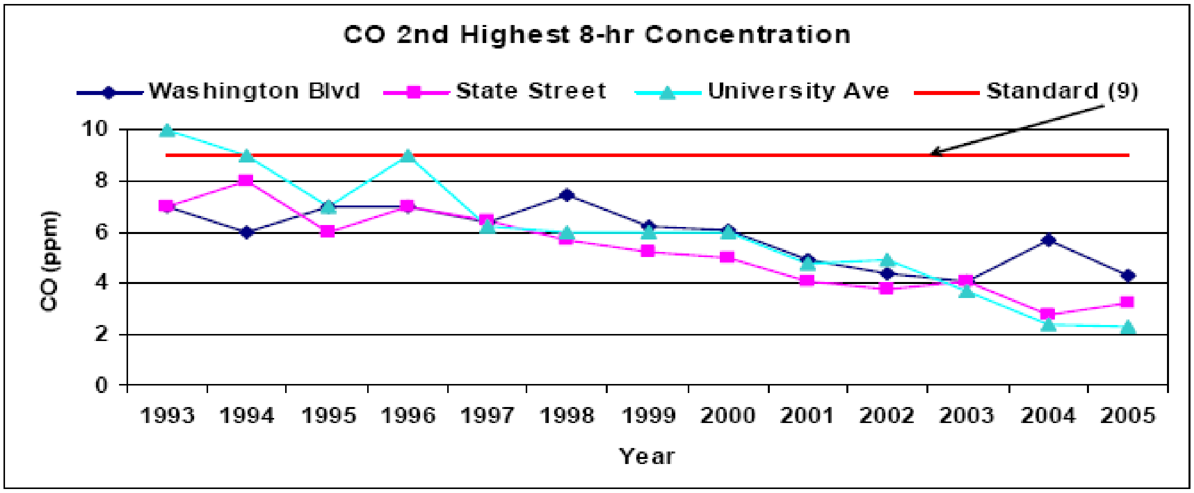


Figure 3.19-8: Nitrogen Dioxide Annual Averages

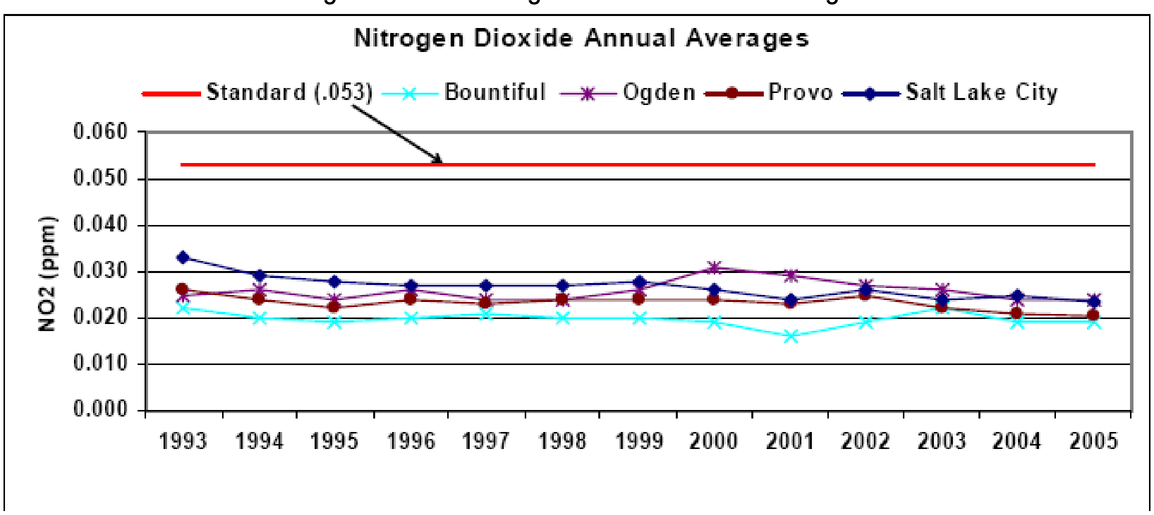


Figure 3.19-9: Three-Year Average Fourth-Highest 8-Hour Ozone Concentration

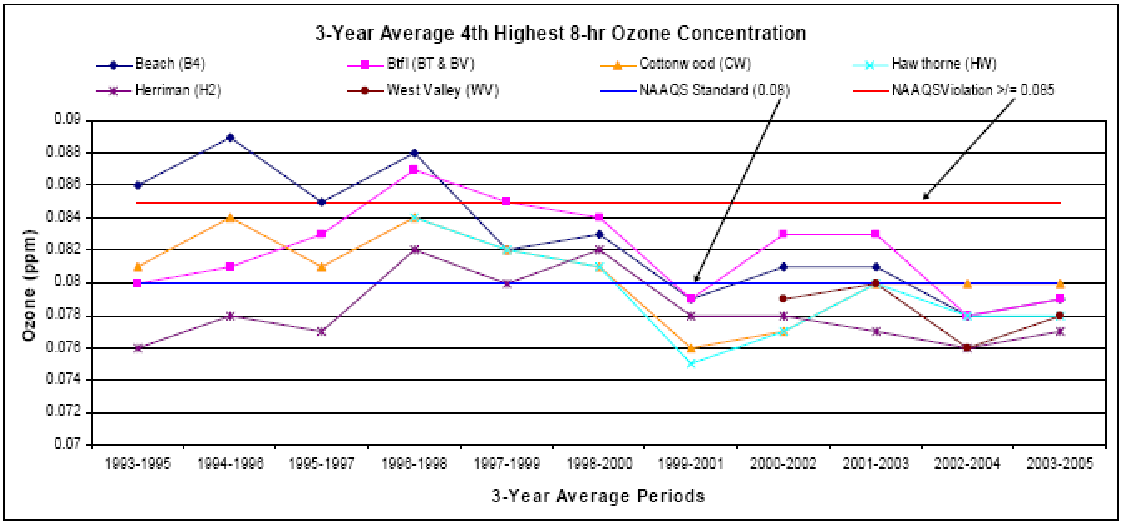


Figure 3.19-10: PM_{10} Annual Mean Concentration

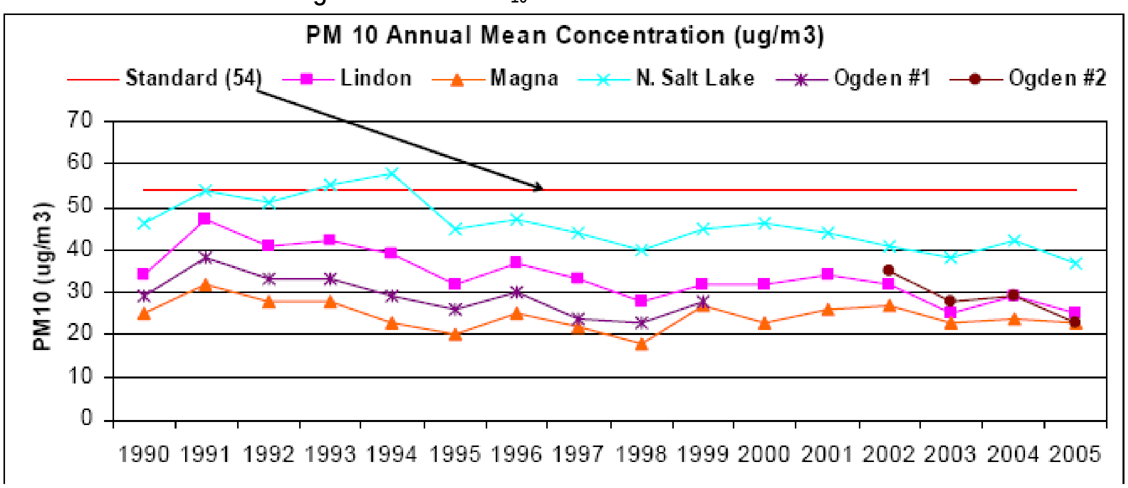
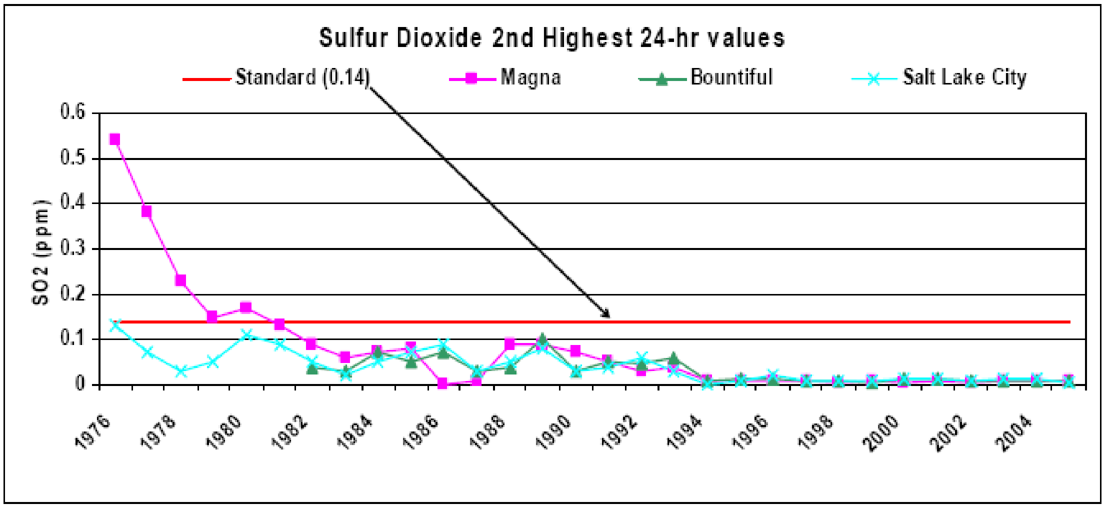


Figure 3.19-11: Sulfur Dioxide Second-Highest 24-Hour Values



No charts were available for lead; however, Utah has not exceeded the health standard for lead since the late 1970s (Utah Division of Air Quality 2006).

Future Trends

With improvements to vehicle emissions and more stringent air quality controls, it is expected that air quality will continue to improve along the Wasatch Front through the 2030 planning period.

I-15 Project Impacts

Regional modeling conducted by the Wasatch Front Regional Council and the Mountainland Association of Governments for the 2030 transportation conformity analyses demonstrated that all regionally significant transportation projects (including the I-15 project) would be in compliance with the National Ambient Air Quality Standards. Population growth in the air quality impact analysis area has had little effect on overall air quality as demonstrated by the continuing improvement in air quality throughout the region. Air pollutant emissions from the I-15 alternatives would increase slightly due to the increase in vehicle-miles traveled because of improved mobility.

Overall, the growth in the area by 2030 would likely be the same with or without the I-15 project. However, the project would help reduce regional traffic congestion and improve travel times, which could help maintain compliance with air quality standards. Improved travel times throughout the region would reduce idling emissions of CO and volatile organic compounds.

Fugitive Dust

During construction of the project and other developments in the I-15 study area, fugitive-dust-control measures would be needed in certain areas to protect disturbed soils from wind erosion until permanent, stabilized cover is established. After the construction phase is completed, the soil would have a lower potential for wind erosion compared to its undisturbed state.

Vehicle Emissions

Vehicle emissions have continued to decrease substantially over time as EPA has imposed a series of tighter emission-control requirements on engine emissions. As the region's vehicle fleet becomes newer and the older, high-emitting vehicles are replaced, it is expected that the tighter emission standards will substantially offset the regional growth in vehicle-miles traveled. Although it is difficult to predict fleet-average emissions for 2030, it is expected that the more stringent federal regulation of motor vehicle emissions will continue to drive vehicle emissions even lower, thus helping to offset the growth in vehicle-miles traveled.

Mobile-Source Air Toxics (MSATs)

Section 3.8 Air Quality in this chapter contains more detailed information on MSATs. Most air toxics originate from human-made sources including on-road mobile sources, non-road mobile sources (such as airplanes), area sources (such as dry cleaners), and stationary sources (such as factories or refineries). MSATs are a subset of the 188 air toxics defined by the Clean Air Act. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

EPA is the lead federal agency for administering the Clean Air Act and has specific responsibilities for determining the health effects of MSATs. On March 29, 2001, EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229). In its rule, EPA examined the impacts of existing and newly promulgated mobile-source control programs, including its reformulated gasoline program, its national low-emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur-control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur-control requirements. Between 2000 and 2020, the Federal Highway Administration (FHWA) projects that, even with a 64% increase in vehicle-miles traveled, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67% to 76% and will reduce on-highway diesel particulate emissions by 90%.

In February 2007, EPA issued a final rule to reduce hazardous air pollutants from mobile sources. The final standards will lower emissions of benzene and other air toxics in three ways: (1) by lowering the benzene content in gasoline, (2) by reducing exhaust emissions from passenger vehicles operated at cold temperatures under 75 degrees Fahrenheit, and (3) by reducing emissions that evaporate from, and permeate through, portable fuel containers.

Under this rule, EPA expects that new fuel benzene and hydrocarbon standards for vehicles and gas cans will reduce total emissions of mobile-source air toxics by 330,000 tons in 2030, including 61,000 tons of benzene. As a result, new passenger vehicles will emit 45% less benzene, gas cans will emit 78% less benzene, and gasoline will have 38% less benzene overall.

$PM_{2.5}$

On March 29, 2007, EPA issued a rule defining requirements for state plans to clean the air in areas with levels of fine particle pollution ($PM_{2.5}$) that do not meet national air quality standards. It is anticipated that portions of Salt Lake and Utah Counties will be designated as non-attainment areas under the revised $PM_{2.5}$ standard (35 $\mu g/m^3$, or micrograms per cubic meter). Non-attainment designations under the revised standard will be in place by the end of 2008, and conformity to the new standard will be required in 2010.

By 2012, Utah will be required to submit a new section to the State Implementation Plan documenting how the State will meet the revised $PM_{2.5}$ standard. Once the $PM_{2.5}$ State Implementation Plan is approved by EPA, WFRC and MAG will be required to make a conformity determination verifying that transportation-related emissions are within the limits established in the Plan. During the interim period from 2010 to 2012 when $PM_{2.5}$ conformity is required to 2013 when emission limits are established in the Plan, WFRC and MAG will be required to establish conformity by demonstrating that future $PM_{2.5}$ emissions are lower than 2005 levels.

Mitigation

FHWA and UDOT conclude that the proposed I-15 project would not have a substantial impact on regional air quality, so no mitigation measures are proposed for direct impacts from use of the I-15 project. Potential construction-related air quality mitigation measures are described in Section 3.18 of this chapter and include development of a Fugitive Dust Emission Control Plan, street sweeping, and maintaining equipment to reduce emissions.

3.19.4.3 Water Quality

This section provides an overview of the cumulative impacts to water quality from the I-15 project and other actions in the area. The geographic scope of this analysis includes the Utah Lake–Jordan River Watershed Management Unit which lies in north-central Utah and includes those streams that drain into Utah Lake and the Jordan River and its tributaries from Utah Lake to the Great Salt Lake. The timeframe of the water quality cumulative impact analysis is about the mid-1970s through 2030. The mid-1970s were selected as the early date for the analysis based on the availability of data. The baseline year selected for the analysis is 2005 based on the availability of 2005 water quality data.

Past Conditions

The rivers and lakes in the Utah Lake–Jordan River Watershed Management Unit have been extensively altered as a result of urban and agricultural development during the past century. Many of the streams that flowed into Utah Lake, the Jordan River, and the Great Salt Lake have been altered for water supplies, control of stormwater, agricultural uses, and urban development. For example, the Jordan River has been altered to reduce its potential for flooding and to allow for urban and agricultural development. As development occurred in the area, the amount of impervious surfaces, sewage-treatment plants, and agricultural areas increased, all of which reduced water quality through the early 1970s.

The decrease in water quality was analyzed in the Utah Lake–Jordan River Watershed Management Unit Stream Assessment (Utah Division of Water Resources 2002). This report estimated that there are 1,314 perennial stream-miles in the Utah Lake–Jordan River Watershed Management Unit, of which 1,025 miles (78.0%) were assessed for support of their designated beneficial uses. Of these 1,025 miles, 848.5 miles (82.7%) were determined to fully support all their beneficial uses, 108.3 miles (10.6%) were determined to partially support their beneficial uses, and 68.4 miles (6.7%) were determined to not support at least one designated beneficial use. The streams that do not support their beneficial use are considered impaired waters.

The major causes of impairment (rivers that don’t support their beneficial use) were metals, habitat alterations, flow alterations, and pH. The major sources of impairment were resource extraction, habitat modification, hydromodification, and agricultural activities. Table 3.19-3 below lists the sources of water quality impairment for streams in the Utah Lake–Jordan River Watershed Management Unit.

Table 3.19-3: Sources of Water Quality Impairment in the Utah Lake – Jordan River Management Unit, 2002

Source	Contribution to Impairment
Resource extraction	19.4%
Unknown	18.1%
Habitat modification	16.7%
Agricultural	14.7%
Hydromodification	14.7%
Urban runoff	6.2%
Industrial point sources	4%
Municipal point sources	4%
Natural sources	2.1%

Source: Utah Division of Water Quality 2002

Within the past several decades, a number of regulatory programs have evolved that control stormwater and restrict direct disturbances of water bodies. The 1987 revisions to the Clean Water Act placed new emphasis on the requirement for cities and counties to obtain permits for stormwater discharges and to mitigate impacts. In addition, the State of Utah requires approval for any project that proposes to disturb any area within the ordinary high-water mark of a stream or lake and controls the amount of disturbance to the water body and requires restoration for any impacts. USACE also regulates impacts to wetlands and navigable waters of the U.S.

The above regulatory controls have resulted in improved water quality in the Jordan River, which is the main water body within the I-15 study area. The quality of water has improved since the passage of the 1972 Clean Water Act. Regulations on municipal waste from wastewater treatment plants, stormwater runoff, and industrial discharges have reduced concentrations of pollutants discharged into the Jordan River (Hooton 1999). In addition, the Jordan River Water Quality Total Maximum Daily Load Assessment (Utah Division of Water Quality 2005) noted that the water quality of the Jordan River has generally improved since implementation of a Section 208 Water Quality Plan in 1975.

Future Trends

The regulatory programs briefly summarized above assure that the rate of hydrologic and water quality degradation in developing areas will be greatly reduced from those that historically occurred. However, the future water resource conditions in the water quality cumulative impact analysis area are difficult to predict accurately. For example, as urban development in the area continues, the amount of impervious surfaces will increase, but other pollutant sources from agriculture and resource extraction will decrease (as these lands will be converted to urban uses), thus making an overall assessment of future water quality conditions difficult. Stormwater regulations could continue to evolve, resulting in new rules such as such as stricter controls from construction sites and new urban development.

I-15 Project Impacts

Alternative 4 would increase the amount of impervious surface from the existing 730 acres to a maximum of 1290 acres, which would increase the potential for stormwater pollution. However, the analysis conducted for the I-15 project showed that the increase in the amount of impervious surface would not change the beneficial-use classifications or further impair water bodies in the area. The reasonably foreseeable projects listed above will further increase impervious surface area in Utah and Salt Lake counties. These projects would also be expected to comply with Clean Water Act and appropriate State regulations to ensure they will not adversely affect water quality. In addition, the I-15 project would include measures to control stormwater runoff and would use detention basins to minimize the amounts of pollutants that are discharged into nearby surface waters. Other transportation projects in the region are also not expected to contribute to major stormwater runoff or reduce water quality because of the controls would be placed on each project to manage runoff and minimize water quality impacts.

The other transportation-related projects listed previously in Table 3.19-1 are not expected to contribute to major stormwater runoff or reduce water quality because of the controls that are placed on projects to manage runoff and minimize water quality impacts. In addition, many of these projects are improving existing roads that have no stormwater controls by adding control measures that could reduce water quality impacts. It is likely that one of the greatest contributors to future water quality impacts will be the urban development that is converting existing undeveloped land into residential, industrial, and commercial uses.

Urban runoff is the cause of about 6.2% of the water quality impairment for streams in the Utah Lake–Jordan River Watershed Management Unit (see Table 3.19-3 above). However, as development increases, this contribution will likely increase. Although development in the water quality cumulative impacts analysis area will occur with or without the I-15 project, roadway improvements in general could contribute to some development growth. It is expected that the amount of urbanized area along the Wasatch Front will increase from about 30,000 acres currently to about 70,000 acres in 2030, an increase of 40,000 acres. This urbanization would include all residential and commercial areas and the necessary infrastructure such as roads (including roads like the I-15). Not all of the 40,000 acres would be impervious surfaces, since the typical amount impervious land cover in residential areas can vary from 12% to 40% and for commercial areas from 60% to 95% (Canter 1996).

The continued urbanization of Salt Lake and Utah Counties could result in cumulative impacts to and degradation of water quality. However, this increase in urbanization would also decrease the amount of agriculture and resource extraction, which are two of the larger factors that impair water quality. It is also likely that, in the future, regulatory controls would be increased to reduce water quality impacts.

Mitigation

Section 3.12 Water Resources of this chapter provides a discussion of water quality mitigation measures. The mitigation measures include the following:

- Develop an erosion-control plan during construction; and
- Use detention basins for the I-15 project to detain runoff and reduce peak flow rate.

3.19.4.4 Wildlife and Wetland Resources

This section provides an overview of the cumulative impacts to wildlife and wetland resources from the I-15 project and other actions in the area. The ecosystems cumulative analysis includes impacts to wildlife and wetland habitat. Because Alternative 4 would have no direct effects on the June Sucker and the Ute ladies-tresses, no cumulative impacts are expected for threatened or endangered species. No cumulative impacts to threatened or endangered species are expected from the I-15 project.

The geographic scope of this analysis includes the Salt Lake, Utah, and Tooele Valleys. These three valleys were selected because they are used by migratory birds that use the wetlands as feeding and resting areas during migration, and because a decrease in wildlife habitat and wetlands in Salt Lake County could affect bird and other local wildlife populations in Tooele County. The timeframe of the cumulative impact analysis is about from the mid-1800s (pre–European settlement) through 2030. The change from historic to current wetlands and habitat availability was estimated using regional scale land cover data (Jones & Stokes 2005). The baseline year selected for the analysis (2003) was based on 2003 land cover data.

Past Conditions

Wildlife habitat, wetlands, rivers, and lakes in the Salt Lake, Utah, and Tooele Valleys (Jordan River hydrologic unit, Utah Lake hydrologic unit, and Tooele Valley hydrologic unit, respectively) have been extensively altered as a result of urban and agricultural development during the past century. The wetlands adjacent to Utah Lake and the Great Salt Lake have been extensively altered or lost, and many of the streams that flowed into Utah Lake, the Jordan River, and the Great Salt Lake have been altered for water supplies, control of stormwater, agricultural uses, and urban development. Much of the upland wildlife habitat has also been developed, and only a few areas remain on the west side of the Salt Lake and Utah Valleys. In the three valleys, there has been about a 55% reduction in wetlands and wildlife habitat. The extent of estimated historic wetlands and wildlife habitats and the current conditions are listed below.

About 45% of the estimated historic wetlands and wildlife habitats are still available in the area.

The remaining habitat is estimated below.

- Salt Lake Valley – 38% (37,333 acres);
- Utah Valley – 17% (11,100 acres); and
- Tooele Valley – 80% (56,379 acres).

Based on National Wetland Inventory data, Salt Lake County has about 7,900 acres of wetlands remaining from the historic estimate of 19,500 acres. Utah County has about 11,018 acres remaining out of the historic estimate of 66,200 acres. This is a loss of about 64% and 83%, respectively.

Future Trends

The USACE regulatory wetland program was put in place to mitigate the loss of wetlands and other waters of the U.S. through avoidance, minimization, and creation or restoration of these resources. The resulting federal policy is "no net loss of wetland acres and/or function." Although the amount of future wetlands and the associated aquatic habitat conditions are difficult to predict, these resources could be degraded by encroachment, fragmentation, and/or hydrologic modification. For example, a new road might be adjacent to an emergent marsh or might bisect the marsh. Even if the impacts from the road are mitigated, the result might be wetlands that provide diminished wildlife habitat function for some species. Similarly, such a project could alter the movement of surface water or groundwater, resulting in the direct loss of wetlands outside the specified project area.

Since no regulatory program protects uplands, the associated upland wildlife habitat (such as winter foraging areas) will continue to be developed in the future as the population in the area grows. The expected 40,000 acres in new development will affect upland habitat and some wetland habitat. Other reasonably foreseeable transit and roadway projects in the area could affect between 265 acres and 428 acres of wetlands (see Table 3.19-1), but these impacts would be mitigated. Overall, based on the projected estimates of population growth and population densities, there will continue to be a trend of converting wetlands and wildlife habitat to increasingly dense levels of development.

I-15 Project Impacts

Alternative 4 would result in a loss of wildlife habitat that is primarily heavily disturbed roadway right-of-way and urbanized lands. This conversion of lands to additional I-15 right-of-way would be range from about 300 to 400 acres, depending on the design option, and would be about 1% of what could be lost to anticipated development (about 40,000 acres by 2030) (Envision Utah 2003). With the continued development along the Wasatch Front, much of the existing wildlife habitat on the valley floors would be lost. Future development along the Front could also segment wildlife habitat. Because the steep topography limits some development in the foothills, these areas would experience less impact to wildlife habitat.

Alternative 4 would result in impacts up to 60.43 acres of wetlands, depending on the design option. Although other planned transportation projects could also result in impacts to wetlands, urban growth, regardless of the construction of roads and rails, will likely cause the greatest impact to wetlands between 2002 and 2030. However, all projects subject to a Section 404 individual permit are required to identify the least environmentally damaging practicable alternative, which is the goal of the wetland assessment component of this EIS process. In addition, all projects, including those listed in the table of reasonably foreseeable projects, are required to complete a wetland delineation from which mitigation is determined through avoidance, minimization and/or some form of creation, restoration, or enhancement. No data are available on the exact amount of wetlands to be converted to urban uses because each project is treated independently by USACE. It is expected that all direct impacts will have to be mitigated for (through creation, restoration, or enhancement) within the general vicinity of the project to satisfy the federal policy of no net loss of wetland acres and/or function.

Mitigation

Section 3.15 Wildlife and Threatened and Endangered Species provides a discussion of mitigation measures for wildlife and wildlife habitat, vegetation, wetlands, and threatened and endangered species. The mitigation measures include the following:

Develop and implement wetland mitigation sites that result in an overall no net loss of wetland functions affected by the I-15 project.

3.19.4.5 Threatened and Endangered Species

The study area includes critical habitat for the June Sucker (*Chasmistes liorus),* a federally endangered species. Populations of Ute ladies'-tresses (*Spiranthes diluvialis*), which is federally listed as a threatened species, exist in

Utah Valley, outside the project corridor. Because Ute ladies'-tresses depends on wetlands, the cumulative effects analysis for wetlands, above, also provides a trend for the Ute ladies'-tresses in the area. Future development in Utah and Salt Lake counties could also include critical habitat, however, the only critical habitat in the I-15 corridor is at the Provo River, for June sucker, and future projects are expected to complete consultation pursuant to Section 7 of the Endangered Species Act.

3.19.4.6 Cultural Resources

This section provides an overview of the cumulative impacts to cultural resources from Alternative 4 and other actions in the regional area along the I-15 corridor.

Past Conditions

Past transportation projects and urban growth have affected cultural resources of varying integrity and significance in the region.

Future Trends

Future transportation projects, including the widening and reconstruction of I-15, will affect cultural resources along the I-15 corridor. These future transportation projects will be subject to state and federal regulations regarding cultural properties. Any potential adverse impacts would be subject to avoidance and/or mitigation measures consistent with state or federal regulations and UDOT's current cultural resources guidelines. Other reasonably foreseeable actions presented in Table 3.19-1 will contribute to the additional cumulative effects on cultural resources. These additional, future projects may alter the integrity of cultural resources and impact their eligibility for the National Register of Historic Places.

I-15 Project Impacts

Provo/Orem Options A, B, C and D of Alternative 4 would have an adverse effect on the Provo Viaduct. American Fork Main Street Options A, B and C of Alternative 4 would have an adverse effect on the two historic structures located in American Fork at 150 West 300 South (Map/Site Reference # 50) and 360 W. 200 South (Map/Site Reference # 56).

Alternative 4 would require ground disturbance, construction, and operation and maintenance activities. These activities would disturb comparatively small areas, and primarily affect right-of-way corridors that have already been disturbed. Although construction activities under Alternative 4 would contribute to the cumulative loss of integrity of significant historical properties in the regional area, the contribution would be avoided, minimized, and mitigated to the extent practicable.

Mitigation

There are no mitigation commitments specifically associated with cumulative impacts. The mitigation for the direct and indirect impacts will minimize any potential cumulative impacts in the region.

3.19.4.7 Greenhouse Gases and Global Climate Change

The issue of global climate change is an important national and global concern that is being addressed in several ways by the Federal government. The Transportation sector is the second largest source of total greenhouse gases (GHG) in the U.S., and the greatest source of carbon dioxide (CO_2) emissions – the predominant GHG. In 2004, the transportation sector was responsible for 31 percent of all U.S. CO_2 emissions. The principal anthropogenic (human-made) source of carbon emissions is the combustion of fossil fuels, which account for approximately 80 percent of anthropogenic emissions of carbon worldwide. Almost all (98 percent) of transportation-sector emissions result from the consumption of petroleum products such as motor gasoline, diesel fuel, jet fuel, and residual fuel.

Recognizing this concern, FHWA is working with other modal administrations through the DOT Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases - particularly CO_2 emissions - and to assess the risks to transportation systems and services from climate changes. In Utah, the Governor's Blue Ribbon Advisory Council on Climate Change (BRAC) identified measures that the state could take to minimize the impacts of transportation related GHG. The recommended measures include reducing vehicle mile travelled (VMT) through developing and encouraging the use of mass transit, ridesharing, telecommuting. Other strategies outlined in the BRAC report to reduce CO_2 at the source include promoting the use of low carbon fuels such as alternative fuels, bio-fuels and hybrid vehicles, vehicle technologies resulting in greater fuel efficiency and implementing an idle reduction program for school busses and heavy duty trucks.

Because climate change is a global issue, and the emissions changes due to project alternatives are very small compared to global totals, FHWA did not attempt to calculate the GHG emissions associated with the alternatives. Because GHGs are directly related to energy use, the changes in GHG emissions would be similar to the changes in energy consumption presented in Section 3.20 of this EIS, which indicates a 3 to 4 percent increase for the Preferred Alternative relative to the No-Build. The relationship of current and projected Utah highway CO_2 emissions to total global CO_2 emissions is presented in the Table 3.19-4 below. Utah highway CO_2 emissions are expected to decrease by 6.2% between 2006 and 2030. The benefits of the fuel economy and renewable fuels programs in the 2007 Energy Bill more than offset growth in Utah vehicle miles of travel (VMT); the UDOT Planning Division predicts that statewide VMT will increase by 58% between 2006 and 2030. This table also illustrates the size of the project corridor relative to total Utah travel activity.

Table 3.19-4: Current and Projected Utah Highway CO_2 Emissions

Global CO2 emissions, 2006, MMT[1]	Utah highway CO2 emissions, 2006, MMT	Projected Utah 2030 highway CO2 emissions, MMT	Utah highway emissions, % of global total (2006)	Project study area VMT, % of statewide VMT (2006)
27,578	16.2	15.2	0.06%	6.1%

[1] EIA, International Energy Outlook 2007 (MMT = million metric tons)

3.20 Energy

Energy is consumed during the construction and operation of transportation projects. It is used during construction to manufacture materials, transport materials, and operate construction machinery. Energy used during project operation includes fuel consumed by vehicles using the project and a negligible amount of energy for signals, lighting, and maintenance. Fuel consumption depends on the vehicle miles traveled (VMT) and travel conditions, such as vehicle type, speed of travel, roadway grade, and pavement type. For any given vehicle, speed is the most important factor affecting energy consumption.

Common units of energy measurement are joules and British Thermal Units (BTUs). Because these are relatively small units, energy is often reported in giga joules (billion joules) and million BTUs (MBTUs). One giga joule is the equivalent of 0.95 MBTUs. Even larger amounts of energy are reported in million MBTUs (Tera BTUs). One gallon of gasoline contains approximately 0.13 MBTUs. As a point of reference, the caloric intake for an adult person is approximately 3 giga joules per year (2,000 Calories = 0.008 giga joules).

Since publication of the DEIS, the MPO updated their traffic model to version 6.0. The FEIS incorporates this model version, which reduces expected VMT under the Build and No Build scenarios. This reduces the energy consumption data presented in Table 3.20-1, which has been updated since the DEIS.

3.20.1 Affected Environment

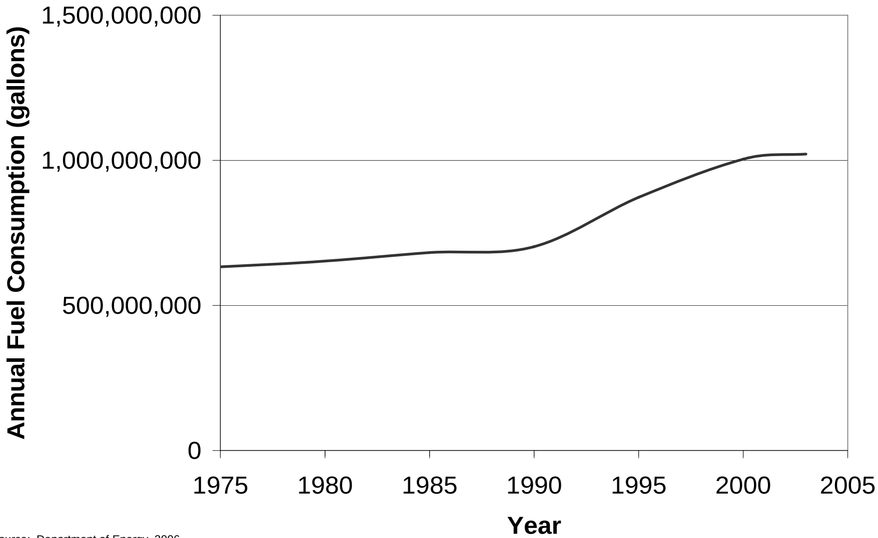
The transportation sector is very energy-dependent upon petroleum. In 2005, transportation within the United States consumed approximately 28,000 Tera BTUs of petroleum and that amount is expected to increase to 39,000 Tera BTUs by 2030 (USDOE 2006a). Gasoline consumption in the United States is projected to increase an average of 1.2 percent annually through 2030.

Vehicle fuel consumption is the primary component of operating costs paid by individual users of transportation facilities. Road geometry, surface conditions, and traffic flows substantially affect the operating efficiency of vehicles, and consequently of total energy consumption.

Nationwide trends over the last 10 to 15 years reflect a lack of progress in fuel economy. New technologies used in hybrid vehicles change the horizon for fuel economy projections and indicate that improvements on the order of 100 to 200 percent may be possible (EPA 2005). Recent developments suggest various potential pathways for possible future fleet wide fuel economy improvements, including voluntary commitments by some manufacturers to improve the fuel economy of certain portions of their fleets by as much as 25 percent.

In 2003, petroleum use in the state of Utah accounted for approximately 39 percent of all energy consumption (USDOE 2006b). Approximately 49 percent of petroleum use is for motor vehicle fuel. During this same timeframe, 1.02 billion gallons of fuel were consumed by motor vehicles in the state of Utah (Figure 3.20-1). Transportation energy consumption in the state of Utah increased by approximately 1.7 percent annually during the 1980s, 4.9 percent annually during the 1990s, and has remained relatively stable since the turn of the century. Total statewide annual energy consumption was 705 trillion BTUs in 2003 (USDOE 2006b).

Figure 3.20-1: State of Utah Fuel Consumption Trend



Source: Department of Energy, 2006

3.20.2 Energy Impacts

The I-15 Corridor Project would create the greatest energy demands in the following areas: long-term operational energy consumption related to vehicle travel and short-term construction-related energy consumption.

For the I-15 alternatives, fuel consumption rates can be differentiated by comparing changes in traffic operations, as measured by VMT and changes in traffic speed. This information was obtained from the travel demand forecasting models developed by the Wasatch Front Regional Commission and the Mountainland Association of Governments. Fuel consumption is proportional to distance traveled and is affected by speed. Fuel economy increases with speed up to about 30 miles per hour (mph), is fairly flat between about 30 mph and 60 mph, and decreases as speed increases above that point (USDOE 2002).

3.20.2.1 Operation Impacts

The analysis of operational energy within the study area is based on the transportation analyses prepared for this project. By using daily Vehicle Miles Traveled (VMT) and speed values calculated from the transportation forecasting model for the study area, net changes in overall energy consumption caused by operation of the alternatives were assessed.

The energy consumption calculations were made by calculating the VMT and speed for the roadway network in the study area for three periods each day: AM peak, PM peak, and off-peak. Energy consumption was calculated by multiplying the VMT for each roadway link during each period with the appropriate average vehicle fuel consumption for the link's speed. The fuel consumption rate in gallons of fuel consumed per mile of travel is the inverse of fuel economy in units of mpg.

The alternatives were compared based on daily differences in fuel consumed by traveling vehicles (USDOT 1980). This value is approximate for each alternative and does not include the minimal energy used for facility maintenance and signal operation. However, it provides a good basis for comparing the alternatives.

Traffic is predicted to increase in the project area by the year 2030, independent of construction of this project. The estimated 2030 energy consumption, resulting from daily vehicle operations in the study area, is shown in Table 3.20-1. Consumption is calculated by using average network speed to calculate a fuel consumption rate, and multiplying that rate by VMT (Transportation Energy Data Book: Edition 22, U.S. Department of Energy, Oak Ridge National Laboratory, Tennessee, 2002).

Table 3-20.1: 2030 Energy Consumption by Alternative

Alternative	Daily VMT	Average Network Speed (mph)	Daily Energy Consumption		
			Gallons	Giga Joules	MBTUs
Alternative 1, No Build	19,565,000	36.0	628,040	85,950	81,850
Alternative 4, I-15 Widening and Reconstruction, with Option A	20,424,000	38.5	655,610	89,720	85,450
Alternative 4, I-15 Widening and Reconstruction, with Option B	20,312,000	38.4	652,020	89,230	84,980
Alternative 4, I-15 Widening and Reconstruction, with Option C	20,271,000	38.3	650,700	89,050	84,810
Alternative 4, I-15 Widening and Reconstruction, with Option D	20,275,000	38.3	650,830	89,060	84,820

In 2030, the total number of daily VMT in the energy analysis study area would be approximately 19.5 million for the Alternative 1 No Build and 20.3 million for all four build options under Alternative 4. As the American Fork Main Street options A, B and C have the same VMT, a separate operational energy consumption analysis for this location was not calculated as there would be no differences among the three options.

In addition, average traffic speeds are predicted to be equal among all build options, at approximately 38 mph, which is 5.5 percent faster than average traffic speeds for the Alternative 1 (62 mph). These results indicate that neither VMT nor average network speeds would change noticeably for the options under Alternative 4. This indicates that energy consumption would remain approximately the same among all of the Alternative 4 build options. However, the increased freeway capacity associated with Alternative 4 would increase the daily VMT in the energy analysis study area by approximately four percent as compared with the Alternative 1 No Build.

3.20.2.2 Construction Impacts

Energy is consumed both directly and indirectly during project construction. Direct energy consumption includes the energy used to operate construction machinery, provide construction lighting, and produce and transport materials such as asphalt. Indirect energy consumption includes activities such as manufacturing and maintaining construction equipment, and the energy consumed by workers commuting to the project site. Because direct one-time energy consumption for roadway projects is much greater than indirect energy consumption and indirect energy consumption is difficult to define, only direct energy consumption is considered in this evaluation (Caltrans 1983). More of the construction energy consumption is in the form of petroleum than electricity.

The energy consumption required to complete a project is proportional to the project size and the nature of the work involved. For projects of a specific type, the energy required for construction is proportional to the project cost, as the project cost is directly related to the project size. As a result, energy consumption for a specific project can be estimated based on its cost and type. Caltrans has developed construction energy factors that were related to 1977 construction dollars (Caltrans 1983). The U. S. Department of Labor (USDOL) tracks a price index for highway and street construction (USDOL 2002). Using the highway and street construction price index, the energy factors can be referenced to year 2002 dollars (Table 3.20-2). Construction energy consumption factors represent a simplified relationship between project size and energy consumption. The results obtained from their use are not exact, but provide a basis of comparison between alternatives.

Table 3.20-2: Construction Energy Consumption Factors (2002 Dollars)

Facility Type	Factor (MBTU / thousand dollars)
Rural Freeway	26.5
Rural Conventional Highway	25.2
Rural Freeway Widen	16.5
Rural Conventional Highway Widen	17.8
Urban Freeway	10.5
Urban Conventional Highway	9.6
Urban Freeway Widen	9.4
Urban Conventional Highway Widen	8.9
Interchange	26.8

In addition to the energy directly consumed by vehicles and used for facility operation and maintenance, transportation systems indirectly consume energy. For example, the manufacturing and routine maintenance of vehicles requires energy. Indirect energy consumption would vary little between the alternatives because construction of one alternative rather than another is not expected to affect people's decisions to purchase new vehicles or have maintenance completed on their current vehicles. Indirect energy consumption includes all forms of energy, as it accounts for manufacturing and maintenance of all resources associated with, but not part of, the facility, such as the tires of cars that drive on I-15.

Construction energy consumption was estimated for Alternative 4 with Options A through D in the Provo to Orem area by estimating the energy consumed based on the project's construction cost. The build alternatives fall into the Urban Freeway Widen category and the approximate construction energy consumption factor for this category (adjusted to year 2002 construction cost dollars) is 9.4 MBTUs per thousand 2002 dollars of construction cost.

During construction, Alternative 4 would result in the consumption of energy to manufacture and transport materials, as well as operate construction equipment. The total energy that would be consumed for each build option under Alternative 4, over the course of the construction period, is presented in Table 3.20-3. The values shown correspond to between 4.2 and 4.6 percent of the energy consumed in the state of Utah in 2003. This consumption would not place substantial additional demand on energy sources or fuel availability in the state during the construction period.

Table 3.20-3: Total Construction Energy Consumption

Alternative	Construction Cost (million 2002 dollars)[1]	Energy Consumption	
		Giga Joules	MBTUs
Alternative 4, Provo/Orem Option A	3,277	32,400,000	30,800,00
Alternative 4, Provo/Orem Option B	3,231	32,000,000	30,400,00
Alternative 4, Provo/Orem Option C	3,067	27,400,000	28,800,00
Alternative 4, Provo/Orem Option D	3,021	30,900,00	28,400,00

[1] Construction costs were developed in 2006 dollars but were discounted to 2002 dollars for this analysis.

3.21 Short-Term Uses versus Long-Term Productivity

Short-term impacts would occur primarily during and immediately after the construction of the facility. As described in Section 3.18 Construction Impacts, the construction phase would temporarily affect water quality, vegetation, wetlands, fisheries, traffic flow, noise, air quality, and socio-economic conditions. However, mitigation measures would be used to minimize any adverse temporary impacts.

Long-term impacts would be beneficial. Traffic congestion would be reduced and safety improved. More efficient energy use and a decrease in vehicle emissions would result.

The proposed improvements to the I-15 corridor are based on state-level, municipal planning organization, county and local municipal planning for land use and transportation facilities. These planning activities have considered the present and future need for transportation service within the context of present and future land use development. Thus, the short-term impacts and use of resources is consistent with the maintenance and enhancement of long-term productivity. These benefits apply to the immediate vicinity of the highway, the cities within the corridor, and the state of Utah.

3.22 Irreversible and Irretrievable Commitment of Resources

Construction and use of the proposed project would require the expenditure of various types of resources, including construction materials, fuels, land, labor, and financial assets. Expenditure of these resources would require an irreversible commitment during the life of the project. Others are not retrievable even beyond that time.

Land within the right-of-way would be unavailable for other uses during the time that it is used as a highway facility. Most of this land is already impacted by the existing facility. The acquisition of additional right-of-way that would be required for the addition of traffic lanes and other improvements under Alternative 4 would slightly increase the amount of land that would not be available for other purposes. Conversion of this land from its present use would be irreversible during the life of the facility. However, the land could be converted to another use at the time that the proposed facility is no longer needed. However, such a conversion is not likely to be necessary or desirable within the foreseeable future.

Considerable amounts of fuels, labor, and construction materials would be expended in the construction of the highway facility. These resources are generally not retrievable. However, their use is not expected to have an adverse effect on the continuing supply for other purposes. The commitment of these resources is based on a public policy that the project would provide measurable benefits to the residents of the area. These benefits include improved access to communities, a reduction in traffic congestion, a higher level of safety, an improved availability of community services, and increased opportunities for economic development and job creation.

A substantial expenditure of public funds would be required to construct the proposed project. These funds, which are derived from taxes imposed at different levels of government, are not retrievable. However, their use would be the result of the decision by public officials to provide facilities that are needed by the citizens of the area. The expenditure of these funds would also create new opportunities for economic activities that would result in the generation of increased tax revenues.

3.23 Permits and Final Approvals Required

Implementation of Alternative 4 will require the permits shown in Table 3.23-1.

Table 3.23-1: Required Permits and Clearances

Permit/Clearance	Granting Agency(ies)	Applicant
Federal Permits, Reviews and Approvals		
Section 404 Permit (Clean Water Act)	USACE	UDOT
Section 401 of the Clean Water Act Certification	Utah Division of Water Quality	UDOT
Section 402 Permit (UPDES)	Utah Division of Water Quality	Contractor
Approval of Addition or Modification of Access Points	FHWA	UDOT
Section 7 Consultation and Biological Assessment /Incidental Take Statement	USFWS	FHWA/UDOT
Section 106 of the National Historic Preservation Act	Utah SHPO and Advisory Council on Historic Preservation	FHWA/UDOT
Blanket Certification (prior notice)	Federal Energy Regulatory Commission	Gas company
State Permits, Reviews and Clearances		
Stream Alteration Permit	Utah Division of Water Rights	UDOT
Air Quality Approval Order	Utah Division of Air Quality	Contractor
Certificate of Registration	Utah Division of Wildlife Resources	Contractor
Approval of Remediation Work Plan	UDEQ or EPA	UDOT
Construction-related permits for all of the above	Various agencies	Contractor
Local permits and Clearances		
Floodplain Development Permit	Local jurisdictions	UDOT

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3.24 Comparison of Alternatives

Table 3.24-1 summarizes the impacts of Alternative 4 on resources evaluated in this chapter and Chapter 4. It provides a comparison among Options A, B, C, and D in the Provo/Orem area; and among Options A, B, and C in the American Fork Main Street area. The second column in the table labeled "Alternative 4 Totals (Common Area Only)" provides the resource impact information for those sections of I-15 that are outside the Provo/Orem Option area and the American Fork Main Street Option area. To determine the impact of Alternative 4 for the entire 43-mile long corridor for a given resource, the information for any option in the Provo/Orem Option area and for any American Fork option should be added to the information in the "Alternative 4 Totals" column. The far right column provides the minimum and maximum range of Alternative 4 impacts for the 43-mile long corridor. Impacts from the Preferred Alternative are listed in parentheses in the final column.

Table 3-24.1: Summary of Alternative 4 Impacts by Design Option

Impact Category	Alternative 4 Totals (Common Area Only) (Preferred)	Provo/Orem Option A Only	Provo/Orem Option B Only	Provo/Orem Option C Only	Provo/Orem Option D Only (Preferred)	American Fork Main Street Option A Only	American Fork Main Street Option B Only	American Fork Main Street Option C Only (Preferred)	Range of Alternative 4 Total Impacts (Preferred in parentheses)
Land acquired	354 acres	137 acres	118 acres	89 acres	75 acres	49 acres	61 acres	63 acres	478 to 544 acres (492)
Prime Farmland	0 acres	0.15 acres	0.15 acres	0 acres	0 acres	1.43 acres	29.81 acres	4.92 acres	1.43 to 29.96 acres (4.92)
Farmland of Statewide Importance	0 acres	9.08 acres	9.08 acres	0.45 acres	0.45 acres	9.50 acres	12.66 acres	10.62 acres	9.95 to 21.74 acres (11.07)
Farmland of Unique Importance	3.54 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	3.54 acres (3.54)
Agriculture Protection Areas	0.25 acres	0 acres	0 acres	0 acres	0 acres	0 acres	5.09 acres	0 acres	0.25 to 5.34 acres (0.25)
Relocations									
Housing Units	12	73	19	55	2	1	3	1	15 to 88 (15)
Businesses	20	39	38	8	16	9	9	10	37 to 69 (46)
Noise receptors above Noise Abatement Criteria	428	291	291	291	291	103	124	103	822 to 843 (822)
Wetlands	24.75 acres	27.68 acres	27.89 acres	19.62 acres	16.95 acres	5.28 acres	7.79 acres	5.25 acres	46.95 to 60.43 acres (46.95)
Threatened and Endangered Species and Habitat	"No direct effects" for 16 species. "No effects likely" for 4 species. *No differences between design options.*								"No direct effects" for 16 species. "No effects likely" for 4 species.
Adverse impacts to historic properties	0	1	1	1	1	2	2	2	3 (3)
Hazardous Waste sites	3 potential contaminant sites within 0.10 mile. Low potential for impacts. *No differences between design options.*								3 potential contaminant sites within 0.10 mile. Low potential for impacts.
Section 4(f) Use (Chapter 4)									
Use	0	1	1	1	1	2	2	2	3 (3)
de minimis	10	5	3	3	2	2	2	1	13 to 17 (13)

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